Computing, Information, and Communications R&D

Briefing to Presidential Advisory Committee

February 27, 1997

John C. Toole

Chair, Computing, Information, and Communications R&D Subcommittee
Director, National Coordination Office for Computing, Information, and Communications

Organizational Structure

WHITE HOUSE

Executive Office of the President
Office of Science and Technology Policy

National Science and Technology Council

Committee on Computing, Information, and Communications (CCIC)

NCO for Computing, Information, and Communications

Federal Networking Council

Computing, Information, and Communications R&D Subcommittee

Applications Council

High End Computing and Computation Working Group (HECC)

Large Scale Networking Working Group (LSN)

High Confidence Systems Working Group (HCS)

Human Centered Systems Working Group (HuCS)

Education, Training, and Human Resources Working Group (ETHR)

Key Names and Acronyms

Old Name		New Name		Remarks
Acronym	*Full Name*	*Acronym*	*Full Name*	
FCCSET	Federal Coordinating Council for Science, Engineering, and Technology	**NSTC**	**National Science and Technology Council**	• When the NSTC was created by Executive Order on November 23, 1993, it replaced the FCCSET as the organization to which the CIC (and later the CCIC) reports.
CIC	Committee on Information and Communications	**CCIC**	**Committee on Computing, Information, and Communications**	• Committee established in November 1993 • Name change effective October 1996
HPCC Program	High Performance Computing and Communications Program	**CIC R&D programs**	**Computing, Information, and Communications R&D programs**	• The HPCC received bipartisan Congressional support with the passage of Public Law 102-194 in 1991 and authorization of funding for many HPCC agencies for FY 1992 - FY 1996
HPCCIT Subcommittee	High Performance Computing, Communications, and Information Technologies Subcommittee	**CIC R&D Subcommittee**	**Computing, Information, and Communications R&D Subcommittee**	• Change effective October 1996
NCO for HPCC	National Coordination Office for High Performance Computing and Communications *Reported to the HPCCIT*	**NCO for CIC**	**National Coordination Office for Computing, Information, and Communications** *Reports to the CCIC*	• NCO for HPCC was established September 1, 1992 • Name change effective October 1996

Evolution of Program Components

HPCC Program		**CIC R&D programs**	
Was organized into five components:		Is organized into five component areas:	
HPCS	High Performance Computing Systems	HECC	High End Computing and Computation
NREN	National Research and Education Network	LSN	Large Scale Networking
ASTA	Advanced Software Technology and Algorithms	HCS	High Confidence Systems
IITA	Information Infrastructure Technology and Applications	HuCS	Human Centered Systems
BRHR	Basic Research and Human Resources	ETHR	Education, Training, and Human Resources

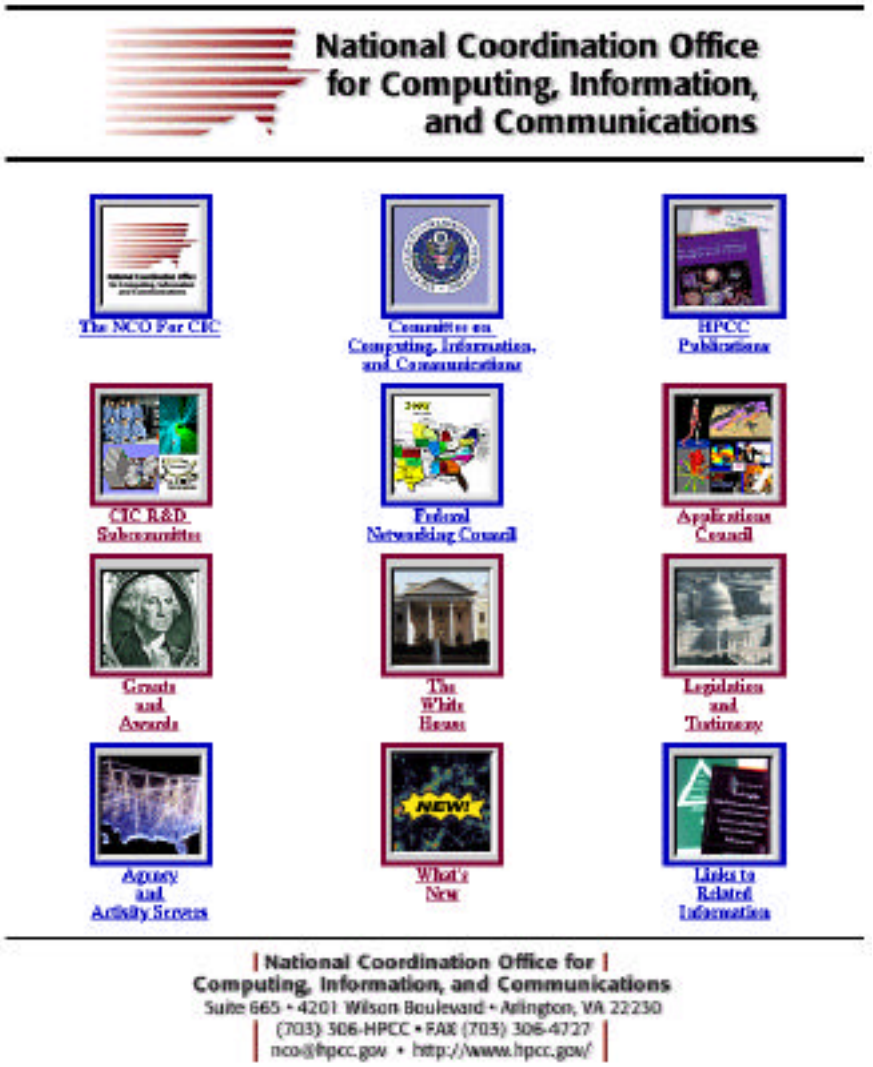
Computing, Information, and Communications R&D Subcommittee

- Coordinates Federal interagency R&D activities in computing, information, and communications technologies
- Coordinates, oversees, and assists R&D Working Groups
- Consists of representatives from each of the participating organizations
- Executive Committee meets monthly
- Reports to the Committee on Computing, Information, and Communications (CCIC)

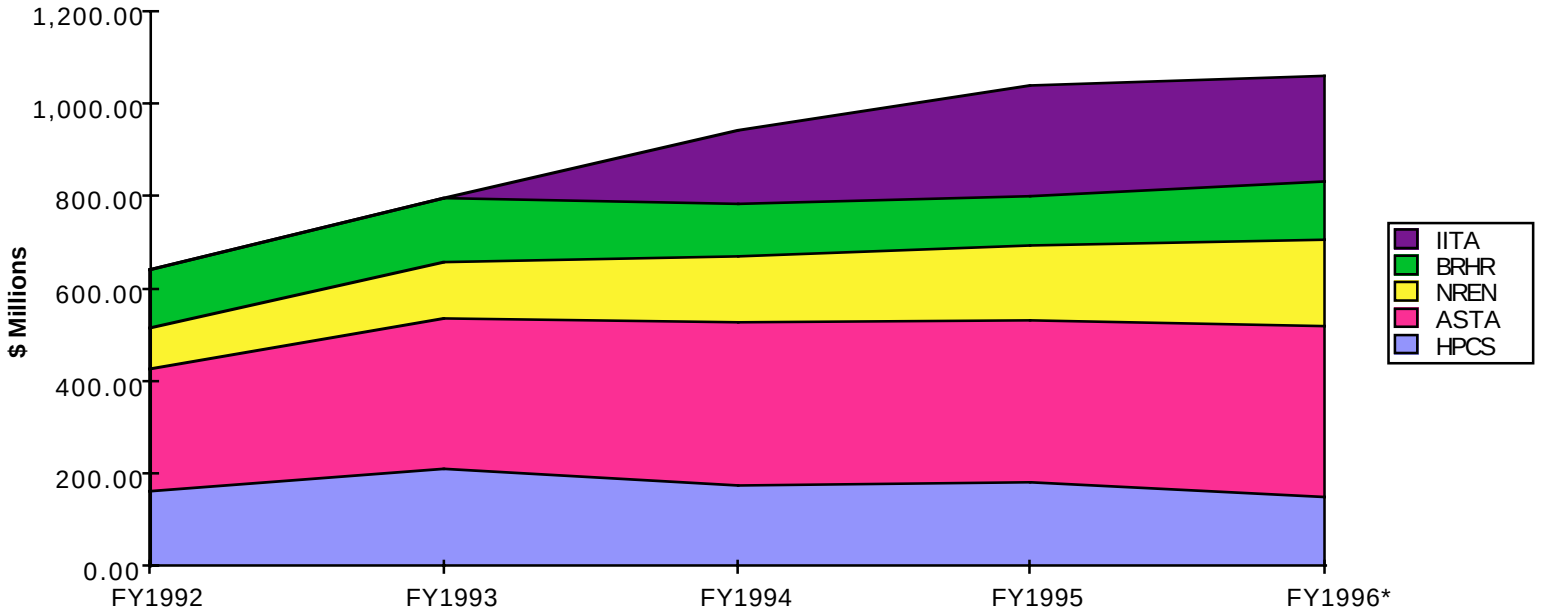
NCO for CIC

- Supports CCIC and its interagency R&D programs
- Coordinate preparation of planning, budget, and assessment documents
- Central point of CCIC contact to U.S. Congress, federal agencies, state and local organizations, foreign organizations, academia, industry, and the public
- All interagency publications and information available at

  http://www.hpcc.gov



Estimated Federal HPCC Program "Actual" Dollars by Components



* Estimated

Draft FY 1997 HPCC Crosscut Budget Request (Dollars in Millions)

Agency	HECC	LSN	HCS	HuCS	ETHR	TOTAL
DARPA	72.7	106.4	10.0	103.6		292.7
NSF	129.2	72.3	1.2	57.8	19.1	279.6
DOE	86.0	14.8		14.9	3.5	119.2
NASA	87.4	14.6	1.6	5.5	5.3	114.4
NIH	23.4	26.5	4.2	27.2	5.9	87.2
NSA	30.4	3.5	7.3			41.2
NIST	4.0	2.5	3.4	13.7		23.5
VA	1.0	9.4	2.3	1.8		14.5
ED				11.4	6.6	18.0
NOAA	4.3	2.7		0.5		7.5
EPA	6.6			0.6		7.2
AHCPR				4.2		4.2
TOTAL	445.0	252.6	30.05	241.2	40.4	1,009.2

Draft FY 1998 HPCC Crosscut Budget Request (Dollars in Millions)

Agency	HECC	LSN	HCS	HuCS	ETHR	TOTAL
DARPA	84.8	89.2	9.4	137.9		321.3
NSF	132.9	79.2	0.9	60.2	21.0	294.2
DOE	90.8	48.8		9.9	3.0	152.5
NASA	90.9	25.1	2.8	4.9	4.7	128.4
NIH	23.7	28.2	4.1	29.3	6.4	91.7
NSA	26.4	2.2	7.2			35.8
NIST	4.0	5.5	3.4	13.6		26.5
VA		7.4	5.4	9.2		22.0
ED					12.0	12.0
NOAA	4.3	2.7		0.5		7.5
EPA	5.4			0.8		6.2
AHCPR				5.5		5.5
TOTAL	463.2	288.3+	33.2	271.8	47.1	1,103.6*

+ The requested FY 1988 LSN budget includes funds for the Next Generation Internet (NGI) Initiative. It also reflects the transition of DARPA's mature technology research from networking development to networking applications. For example, DARPA's FY 1998 allocation for HuCS includes $21M transferred from the FY 1997 networking research budget.

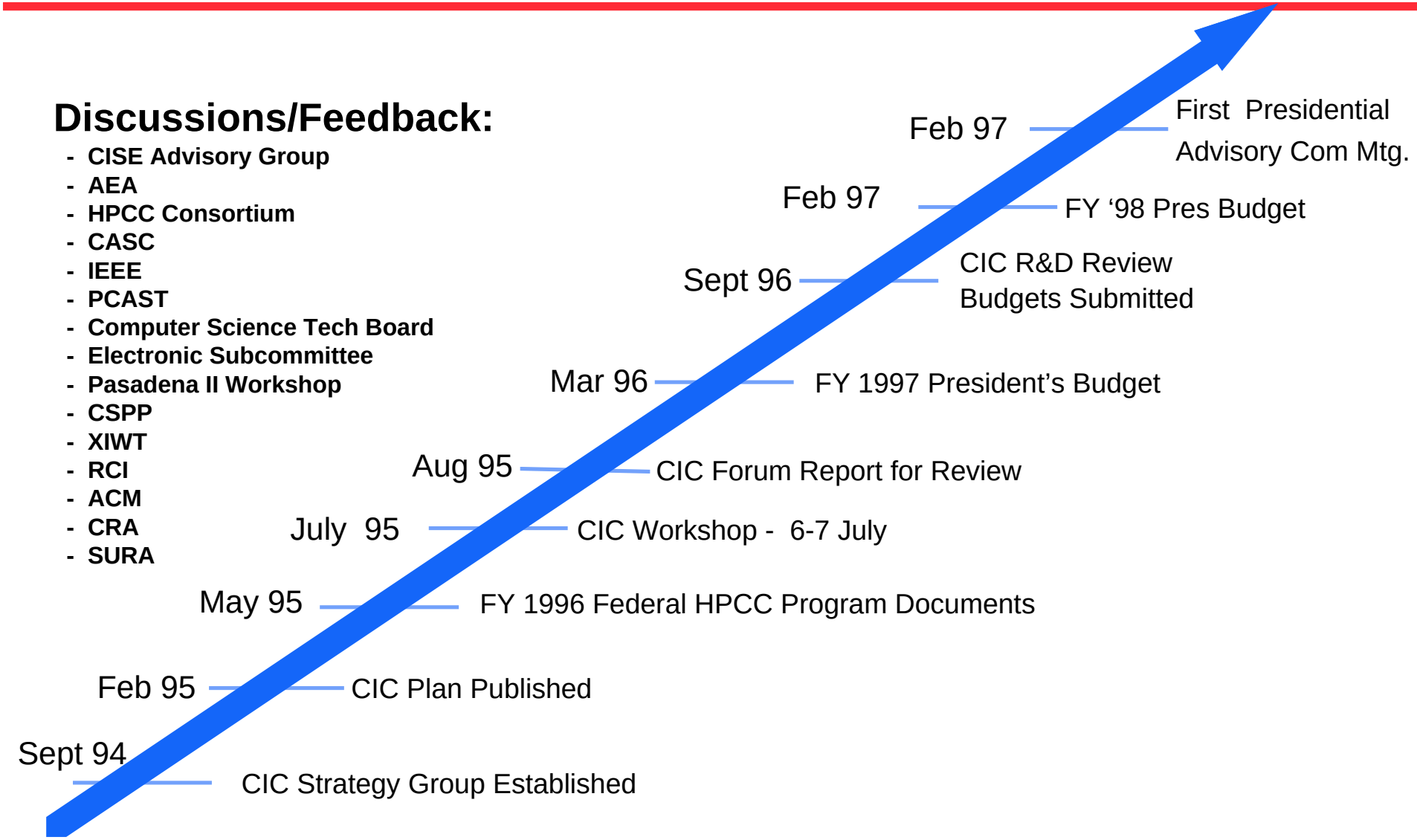
* These totals vary slightly from the President's HPCC Budget. For example, funding for the Department of Transportation, one of the candidate agencies for participation in CIC R&D activities, is not included.

CCIC Strategic Planning - Phase II

(February 1997)

Discussions/Feedback:

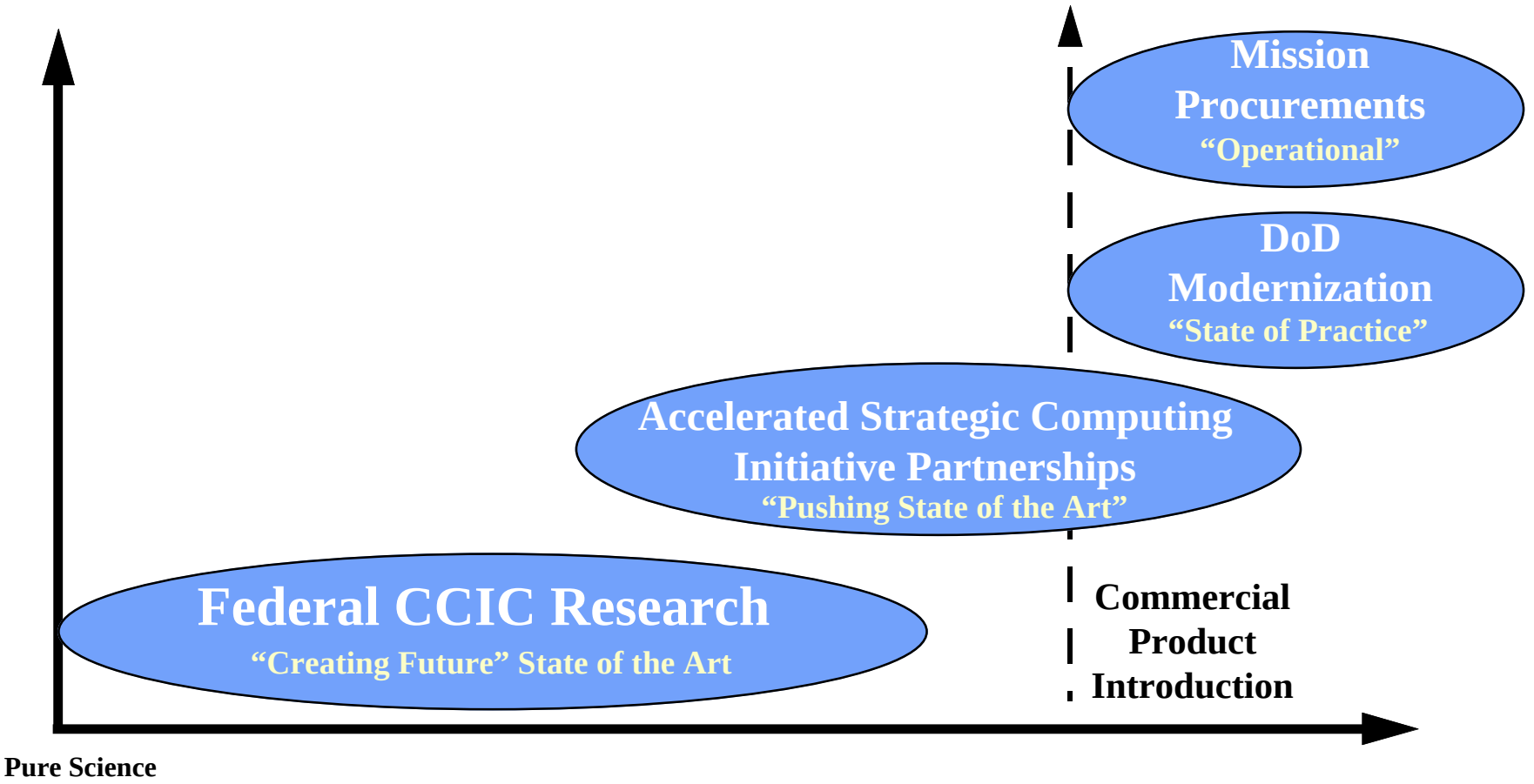
- **CISE Advisory Group**
- **AEA**
- **HPCC Consortium**
- **CASC**
- **IEEE**
- **PCAST**
- **Computer Science Tech Board**
- **Electronic Subcommittee**
- **Pasadena II Workshop**
- **CSPP**
- **XIWT**
- **RCI**
- **ACM**
- **CRA**
- **SURA**



Federal HPCC Program Contributions

- Scalable parallel systems
- Enabling technologies for workstations, distributed systems
- Microkernel Operating Systems
- Internet Networking Technology
- Information Infra, including early WWW Browsers
- Research for Digital Libraries
- Gigabit Testbeds
- Supercomputer Centers
- Grand Challenge Applications
- National Challenge Applications
- Mission applications: e.g., National Security, Medicine, Environment, and Education

Related Federal Programs



Characterization of Maturity

Organizational Structure

WHITE HOUSE

Executive Office of the President
Office of Science and Technology Policy

National Science and Technology Council

Committee on Computing, Information, and Communications (CCIC)

NCO for Computing, Information, and Communications

Federal Networking Council

Computing, Information, and Communications R&D Subcommittee

Applications Council

High End Computing and Computation Working Group (HECC)

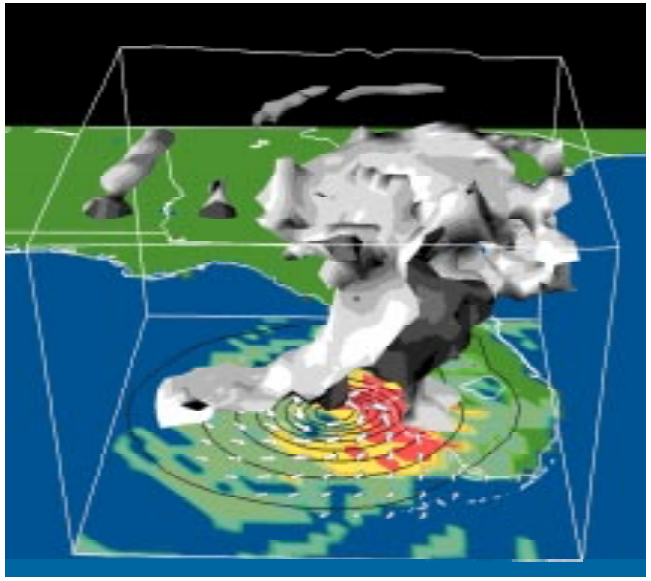
Large Scale Networking Working Group (LSN)

High Confidence Systems Working Group (HCS)

Human Centered Systems Working Group (HuCS)

Education, Training, and Human Resources Working Group (ETHR)

Examples of High End Computing and Computation Projects



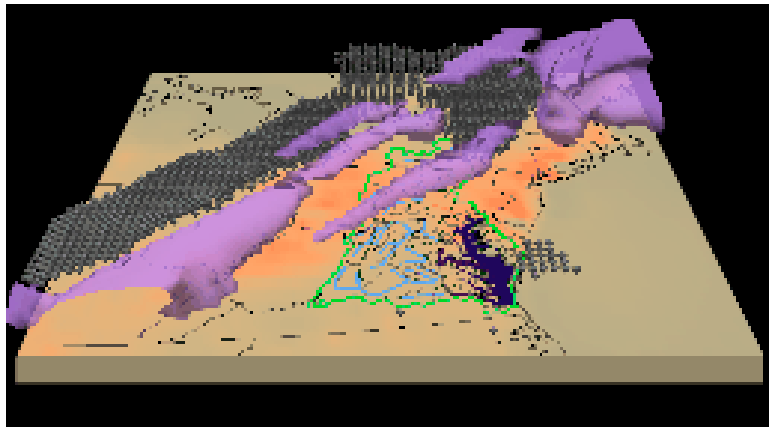
Tropical Storm Gordon, just before becoming a hurricane

GFDL/NOAA Hurricane Model

- Hurricane Prediction System
- 1993 - Run in semi-operational test mode
- 1994 - Part of National Centers for Environmental Prediction operational hurricane forecast suite
- 1995 -Model became fully operational
- 1996 - High resolution models run on highly parallel systems for the Centennial Olympics
- Run for tropical systems at all development stages
- Found to be in top performance group for forecasts out to 36 hours and superior to all other forecast models at 48 and 72 hours

Environmental Modeling

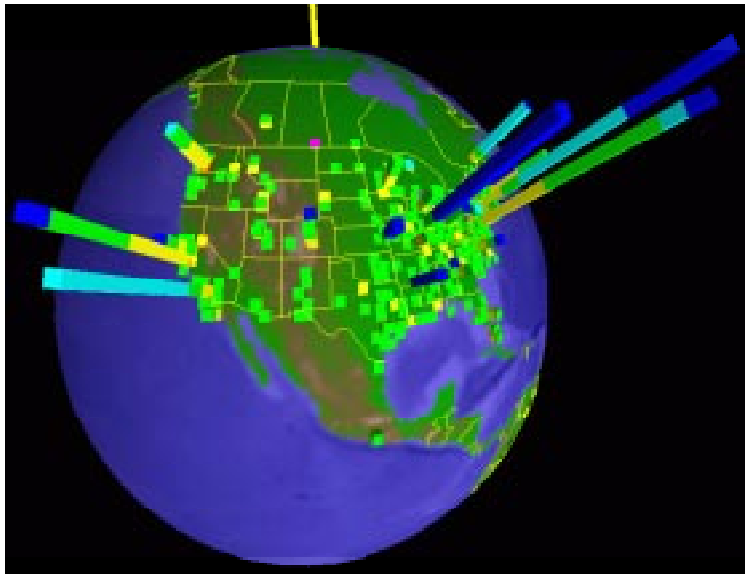
- Parallel logarithms used to model movement of groundwater contaminants
- Numerical simulations to estimate impact of decades of toxic pollution
- Research on nonlinear optimization and control techniques used to minimize groundwater cleanup costs
- Regional Particulate Model (RPM) developed to monitor air quality by region
- Parallel computing used to quantify potential effects of earthquakes on new construction and to assist in creating new safety codes



Simulation of nitrogen deposition to the Chesapeake Bay and surrounding areas during a rainstorm.

Examples of Large Scale Networking Projects

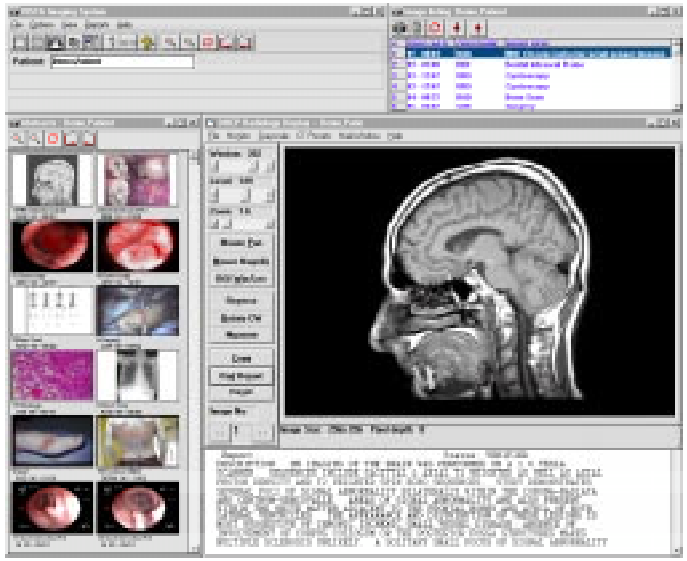
- I-Way was an extensive networking project introduced at Supercomputing ’95
- Experimental, high performance network
- Linked over a dozen high performance computers and advanced visualization machines
- Used as testbed to prototype:
  - Teraflop-class wide area computing
  - An advanced application development resource

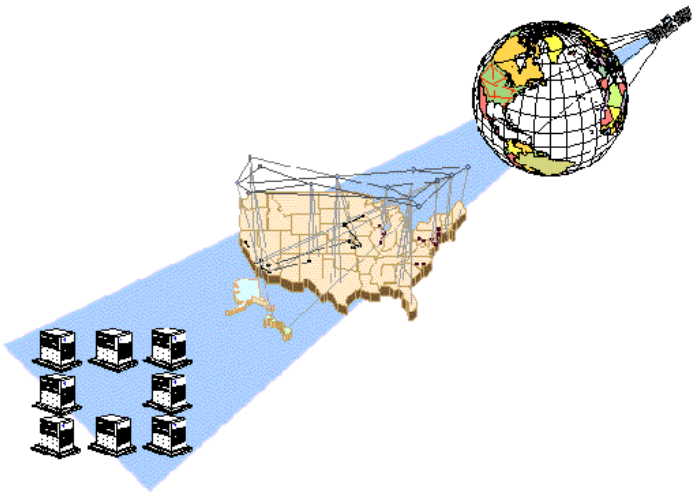


- Begun with development of ARPANET in late 1960s
- Network infrastructure created with NSFNET in 1985
- Development of Mosaic browser in early 1990s
- Community level service turned over to private sector Internet service providers in April 1995
- Unprecedented Internet growth stimulated by HPCC R&D and from public and private investment

Examples of High Confidence Systems Projects

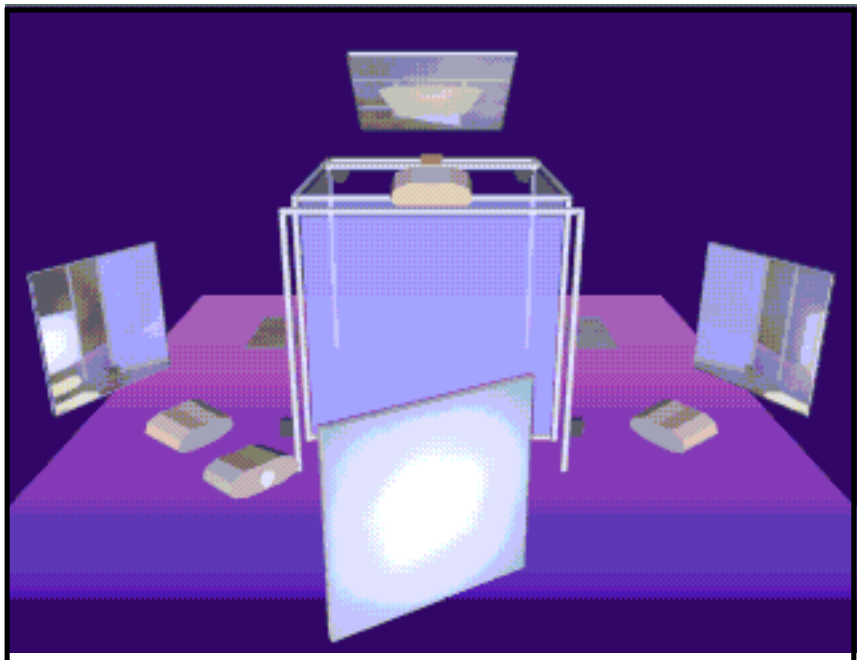
- Merging of computerized patient record systems and telemedicine systems in way that assures integrity and confidentiality of records





- Critical technologies to ensure global, survivable, secure networks that support high performance distributed computing and information systems with dynamic topologies

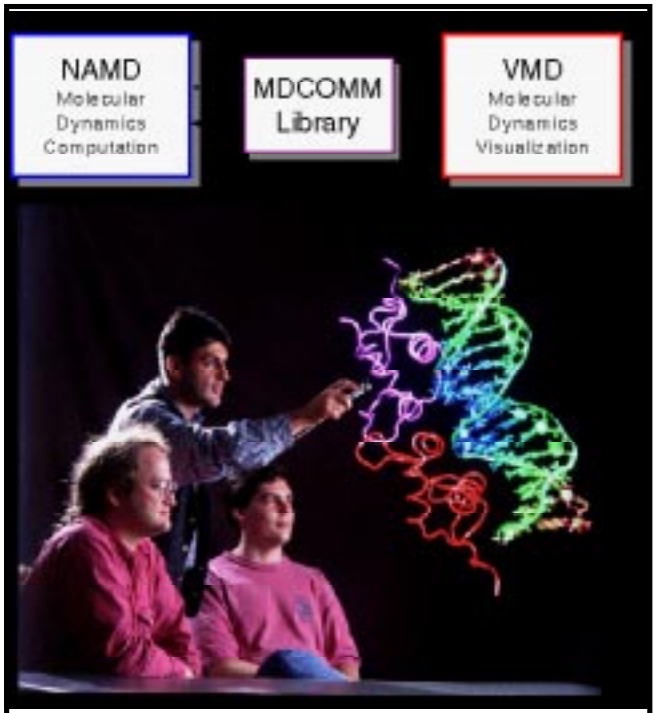
Examples of Human Centered Systems Projects



Surround-screen, surround-sound, projection based virtual reality systems (CAVE)

- Visualization, virtual reality, and human-machine interfaces
- Ability to generate, collect, and manipulate vast amounts of data
- Development of a prototype “omnifocus” electronic camera

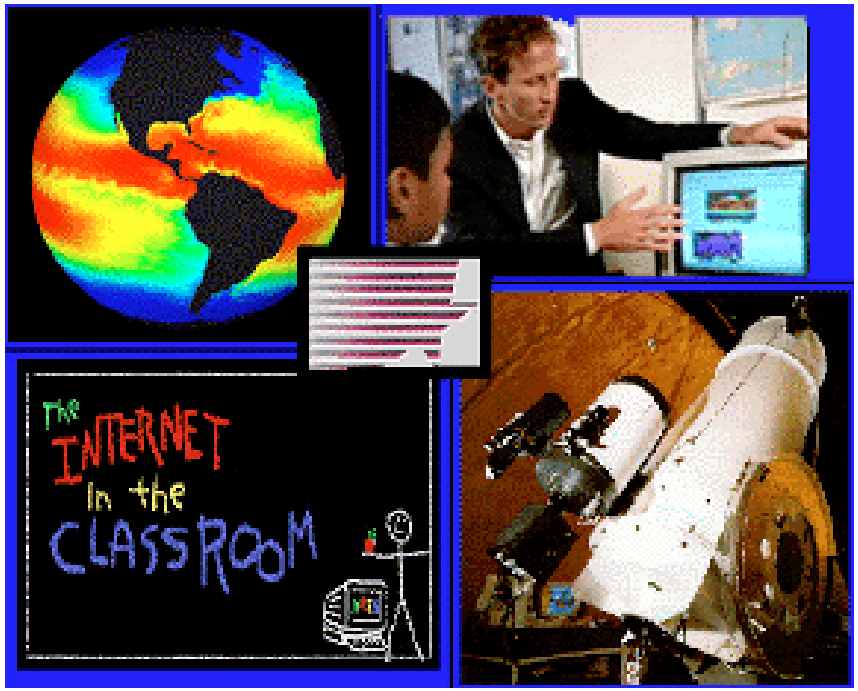
- Health care and biomedical imaging
- Enhance patient care, improved drug design, and broaden access to medical information



Prototype visual medical chart integrating multi-disciplinary medical images

Examples of Education, Training, and Human Resources Projects

- Math and Science Gateway and Gateway for Educators provide web site with access to science and math resources for students and teachers
- Enable design and deployment of multimedia modules used in interactive tutorials
- HorizonNet demonstrates low cost Internet access for a school consortium
- Develop interactive and visualization tools for special educational projects



Now on to the R&D areas.....